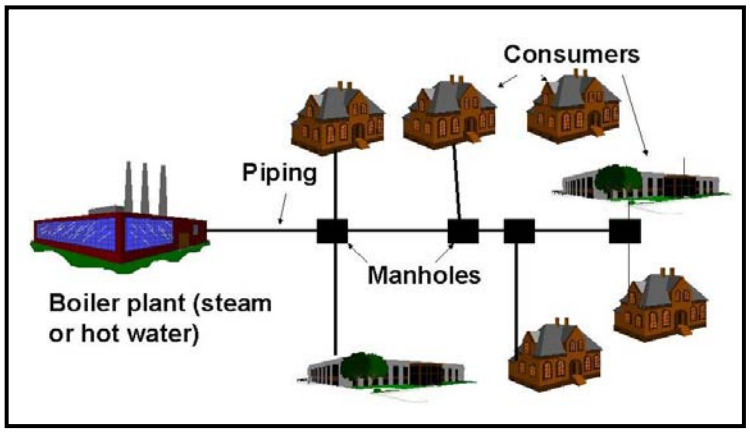
US Army Corps of Engineers®
Engineer Research and Development Center

Heat Distribution System Condition Assessment

Description

The Construction Engineering Research Laboratory (CERL) offers expert heat distribution system (HDS) condition assessments to help Army installation managers make cost-effective, technically justifiable decisions about HDS maintenance and repair (M&R). Engineers use CERL-designed software and inspection methods to perform comprehensive analysis and decision-support tasks to manage Army installation HDSs, and to design, operate, and maintain energy-efficient HDSs at the lowest feasible life-cycle cost. Software components include inventory databases with information describing HDS components (pipes, manholes, steam traps, etc.), and procedures for inspecting HDSs and for calculating a numerical condition index on a scale of 0 to 100 (worst to best). Condition-prediction models can forecast a system's deterioration over time and indicate when M&R will be needed. CERL engineers use this composite information to develop multi-year M&R work plans that consider HDS life-cycle cost and functionality.



CERL-designed software and inspection methods cost-effectively evaluate HDS system components that are out of sight—and otherwise difficult to inspect.

Capabilities

CERL researchers offer their expertise on a reimbursable basis to assess the condition of HDSs and to identify whether there is a need for a major repair or replacement projects for inefficient or failing systems, or whether a simpler, more cost-effective alternative will suffice.

Supporting Technology

CERL uses a number of analytic tools to help assess HDS condition, including:

- ***Acoustic Leak Detection***, a non-destructive inspection technology that allows precise location of leaks in underground utility piping, including heat distribution system conduits and carrier pipes.
- ***HEATMAP***, which allows the engineer to run flow, pressure, and heat loss simulations for a steam, hot water, or chilled distribution system. Simulations can be run for the existing system and for proposed modernization alternatives. HEATMAP also includes economic analysis capabilities. The only input needed for a *HEATMAP* simulation is an accurate map of the distribution system, along with basic data on the buildings served (area and building usage).
- ***The HEATER Condition Assessment and Index Methodology***, which provides a quantitative condition index for heat distribution system components based on a physical inspection. Problems and their severity are identified and documented. This allows system components to be evaluated objectively and prioritized for maintenance, repair, or replacement.

- ***Soil Chemistry Testing and Cathodic Protection Surveys***, which are performed to evaluate whether underground metallic structures, including heat distribution piping, are adequately protected from external corrosion.
- ***Water Chemistry Testing***, which is done to evaluate the adequacy of boiler water treatment programs for the prevention of corrosion and scaling.
- ***Corrosion Prediction Models***, which can predict external (soil-side) corrosion and internal (waterside) corrosion based on soil and water chemistry. The models can predict an approximate year of failure for a given pipe system.

Benefits

Expert HDS condition assessments help Army installation managers make more cost-effective, technically justifiable decisions about HDS M&R. These assessments are required to identify problems and select feasible alternatives, to support funding requests, to validate requirements, and ultimately, to help reduce maintenance and operating costs, conserve energy, improve reliability, and enhance system safety.

Success Stories

In 2004, CERL performed a condition assessment of a high temperature hot water (HTHW) heat distribution system serving nine buildings at the Adelphi Army Research Laboratory. No leaks were found in the carrier pipe, but several holes in the outer conduit were located. Acoustic leak detection technology enabled the leaks to be located with an accuracy of approximately 1 to 2 feet so that they could be easily repaired with minimal excavation. Soil chemistry tests indicated the need to install cathodic protection on the distribution system.

In 2000, the central energy plant (CEP) modernization plan at Fort Stewart, GA focused on the installation's wood-fired boiler, which provides steam for heating, cooling, and domestic hot water. CERL inspected the CEP equipment and evaluated its condition, conducted operational tests ("cold iron" inspections), and outlined two alternative options, which specified the improvements and repairs needed to extend the system life.

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